

mobile stations, keeping backward compatibility with previous generation GSM mobile stations.

Finally, it should be noted that the invention also allows a decrease in complexity for the scheduling of synchronization.

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### CLAIMS

What is claimed is:

1. A method of transmitting signals from a radio device in a radio communication system, wherein a signal comprises a plurality of frames, which carry control channels and traffic channels in a time division multiple access manner, each of the frames containing a plurality of timeslots, wherein: a frame assigned to at least one control channel is modulated using a first modulation scheme and

at least one time slot of one of the frames is modulated to contain a tone; wherein the or each time slot containing the tone is modulated using a second modulation scheme different from the first modulation scheme, and the resulting tone has a frequency the first modulation scheme is unsuited to generate.

2. The method of transmitting signals from a radio device in a radio communication system as claimed in claim 1, wherein a frame assigned to a traffic channel is modulated using the second modulation scheme.

3. The method of transmitting signals from a radio device in a radio communication system as claimed in claim 1, wherein the second modulation scheme is such that a plurality of separate tones can be generated using the second modulation scheme.

4. The method of transmitting signals from a radio device in a radio communication system as claimed in claim 1, wherein each of the plurality of tones indicates a service capability of the transmitting radio device .

5. The method of transmitting signals from a radio device in a radio communication system as claimed in claim 4, wherein said service capability relates to the data traffic capability of the transmitting radio device .

5 6. The method of transmitting signals from a radio device in a radio communication system as claimed in claim 1, wherein the first modulation scheme is GMSK, and the second modulation scheme is 8PSK.

10 7. A radio device of a radio communication system, for transmitting signals comprising a plurality of frames, which carry control channels and traffic channels in a time division multiple access manner, each of the frames containing a plurality of timeslots, the radio device having:  
modulating means for modulating a carrier signal; and

control means for controlling the modulating means during transmission of a signal, wherein

the control means controls the modulating means to modulate a frame assigned to at least one control channel using a first modulation scheme; and

the control means controls the modulating means to modulate at least one time slot of one of the frames to contain a tone;

20 wherein the control means controls the modulating means to modulate the or each time slot containing the tone using a second modulation scheme different from the first modulation scheme and the resulting tone has a frequency the first modulation scheme is unsuited to generate.

25 8. The radio device as claimed in claim 7, wherein a frame assigned to a traffic channel is modulated using a second modulation scheme.

30 9. The radio device as claimed in claim 7, further comprising storage means for storing data relating to the tone, wherein the stored data is used during modulation of the or each time slot containing the tone.

10. The radio device as claimed in claim 7, wherein the second modulation scheme is such that a plurality of separate tones can be generated using the second modulation scheme.

11. The radio device as claimed in claim 7, wherein each of the plurality of tones indicates a service capability of the transmitting radio device.

5 12. The radio device as claimed in claim 11, wherein said service capability relates to the data traffic capability of the transmitting radio device.

13. The radio device as claimed in claim 7, wherein the first modulation scheme is GMSK, and the second modulation scheme is 8PSK.

10 14. A radio device for receiving signals of a radio communication system, which signals of said radio communication system comprise a plurality of frames, which carry control channels and traffic channels in a time division multiple access manner, each of the frames containing a plurality of timeslots, wherein a frame assigned to at least one control channel is modulated using a first modulation scheme and at least one time slot of one of the frames of a signal is modulated to contain a tone, the radio device having

15 means for receiving and demodulating a signal, wherein a frame assigned to a control channel of a received signal is demodulated using the first modulation scheme; and

20 signal processing means to determine the presence of a tone in the at least one time slot of one of the frames of a received signal,

25 wherein the signal processing means is adapted to determine whether the tone in a control frame of a received signal is a predetermined tone, wherein the frequency of the predetermined tone is one resulting from modulation of the or each time slot containing the tone using a second modulation scheme different from the first modulation scheme, and is one the first modulation scheme is unsuited to generate.

30 15. The radio device as claimed in claim 14, wherein a frame assigned to a traffic channel is demodulated using the second modulation scheme.

16. The radio device as claimed in claim 14, wherein the second modulation scheme is such that a plurality of separate tones can be generated

using the second modulation scheme, and wherein the predetermined tone is one of the plurality of tones.

17. The radio device as claimed in claim 14, wherein each of the plurality of tones indicates a service capability.

18. The radio device as claimed in claim 17, wherein said service capability relates to a data traffic capability.

19. The radio device as claimed in claim 16, having selecting means for selecting one of a plurality of radio frequency channels, and control means for controlling the selecting means to select a channel, wherein the control means controls the selecting means to select a radio frequency channel different from the currently received radio frequency channel in response to the failure of the signal processing means to detect a tone indicative of a desired service capability.

20. The radio device as claimed in claim 16, wherein the selecting device comprises an oscillator for converting a received radio frequency signal to baseband prior to demodulation.

21. The radio device as claimed in one of claim 14, wherein the first modulation scheme is GMSK, and the second modulation scheme is 8PSK.

22. A radio communication system comprising at least one radio device as claimed in claim 7 and a plurality of radio devices as claimed in claim 14.

23. A method of receiving signals of a radio communication system in a radio device, which signals of said radio communication system comprise a plurality of frames, which carry control channels and traffic channels in a time division multiple access manner, each of the frames containing a plurality of timeslots, wherein a frame assigned to at least one control channel is modulated using a first modulation scheme and at least one time slot of one of the frames of a signal is modulated to contain a tone,

wherein a frame assigned to the at least one control channel of a received signal is demodulated using the first modulation scheme, and the presence of a tone in at least one time slot of one of the frames of a received signal is determined,

5 wherein it is determined whether the tone in a control frame of a received signal is a predetermined tone, wherein the frequency of the predetermined tone is one resulting from modulation of the or each time slot containing the tone using a second modulation scheme different from the first modulation scheme, the frequency of the predetermined tone being one which the first modulation  
10 scheme is unsuited to generate.

24. The method of receiving signals as claimed in claim 23, wherein a frame assigned to a traffic channel is demodulated using the second modulation scheme.

25. The method of receiving signals as claimed in claim 23, wherein the second modulation scheme is such that a plurality of separate tones can be generated using the second modulation scheme, and wherein the predetermined tone is one of the plurality of tones.

26. The method of receiving signals as claimed in claim 23, wherein each of the plurality of tones indicates a service capability.

27. The method of receiving signals as claimed in claim 26, wherein  
25 said service capability relates to the data traffic capability.

28. The method of receiving signals as claimed in claim 25, wherein a radio frequency channel different from the currently received radio frequency channel is selected in response to a failure to detect a tone indicative of a desired  
30 service capability.

29. The method of receiving signals as claimed in claim 23, wherein the first modulation scheme is GMSK, and the second modulation scheme is 8PSK.